

## ABSTRACT OF THE DISCLOSURE

A process for shifting the bandgap energy of a quantum well layer (e.g., a III-V semiconductor quantum well layer) without inducing complex crystal defects or generating significant free carriers. The process includes introducing ions into a quantum well structure at an elevated temperature, for example, in the range of from about 200 °C to about 700 °C. The quantum well structure that has had ions introduced therein includes upper and lower barrier layers with quantum well layers therebetween. The quantum well structure is then pre-annealed at a temperature and time that does not induce quantum well intermixing, but does diffuse the point defects closer to the quantum well layer. Finally, the structure is thermally annealed at a higher temperature to induce quantum well intermixing (QWI) in the quantum well structure, which shifts the bandgap energy of the quantum well layer.